[θ=27.50, 30.50, 26.50, 28.16, 18.72 or 26.02]

θ=27.5, 33.4, 26.4, 27.3, 28.2, or 25.6,

where θ is an angle between said visual axis and a line normal to said second surface of said ocular optical system in the vicinity of an intersection between said observer's visual axis and said second surface.

71. (Amended) An optical apparatus according to any of claims 27, 28, and 46 through 55, [and 62 through 70,] wherein the following condition is met:

$$1.421 \leq R_{y2}/R_{x2} \leq 1.921.$$

74. (Amended) An optical apparatus according to any of claims 27, 28, and 46 through 55, [and 62 through 70,] wherein the XZ-plane passes through the vertex of said second surface and is perpendicular to the tangent at the vertex.

REMARKS

Claims 27 through 61 and 71 through 77 are pending, with Claims 27, 28, 29, 30, 46, 51, 56, and 57 being independent. Claims 1 through 26 and 62 through 70 have been cancelled to simplify the proposed interference and without prejudice. Claims 36, 71, and 74 have been amended. As discussed with the Examiner, the amendments to Claim 36 are to correct the calculated values of the angles recited therein.

REQUEST FOR INTERFERENCE

Pursuant to 37 CFR 1.607, Applicants respectfully request that an interference be declared involving Claims 27 through 61 and 71 through 77 of the present application of Shoichi Yamazaki, et al. ("Yamazaki") and Claims 1 through 33 of U.S. Patent No. 5,701,202 to Koichi Takahashi ("Takahashi").

A. The Counts

Applicants respectfully propose that the interference be declared with two counts. The proposed counts are set forth as follows:

COUNT 1

An optical apparatus comprising:

a device for displaying an image; and

an ocular optical system for projecting an image formed by said device for displaying an image and for leading the image to an observer's eyeball;

said ocular optical system comprising first, second and third surfaces, in which a space defined by said first, second and third surfaces is filled with a medium having a refractive index larger than 1;

said first, second and third surfaces including, in order from an observer's eyeball side toward said device for displaying an image, a first surface serving as both a

refracting surface and an internally reflecting surface, a second surface serving as a reflecting surface of positive power which faces said first surface and is decentered or tilted with respect to an observer's visual axis, and a third surface serving as a refracting surface closest to said device for displaying an image, at least two of said at least three surfaces, or at least two of said at least first, second and third surfaces, having a finite curvature radius;

wherein any one of said first, second and third surfaces is a decentered aspherical surface;

wherein any one of said first, second and third surfaces is an anamorphic surface;

wherein said optical apparatus satisfies the following condition in a case where a vertical plane containing said observer's visual axis is defined as a YZ-plane, and a horizontal plane perpendicular to the YZ-plane is defined as an XZ-plane:

$$0.5 < |R_{y2}/R_{x2}| \leq 5$$

where R_{y2} is a curvature radius of said second surface in the YZ-plane, and R_{x2} is a curvature radius of said second surface in the XZ-plane.

COUNT 2

An optical apparatus comprising:

a device for displaying an image; and

an ocular optical system for projecting an image formed by said device for displaying an image and for leading the image to an observer's eyeball,

said ocular optical system comprising first, second and third surfaces, in which a space defined by said first, second and third surfaces is filled with a medium having a refractive index larger than 1,

said first, second and third surfaces including, in order from an observer's eyeball side toward said device for displaying an image, a first surface serving as both a refracting surface and an internally reflecting surface, a second surface serving as a reflecting surface of positive power which faces said first surface and is decentered or tilted with respect to an observer's visual axis, and a third surface serving as a refracting surface closest to said device for displaying an image, at least two of said at least first, second and third surfaces having a finite curvature radius; and

wherein said first surface is a reflecting surface having a convex surface directed toward said second surface.

B. Correspondence of Claims to Counts

1. Summary

Applicants respectfully submit that the claims should correspond to the counts as follows:

(a) Count 1: Yamazaki Claims 27, 28, 46 through 55, and 71 through 77, and Takahashi Claims 1 through 3 and 21 through 27; and

(b) Count 2: Yamazaki Claims 29 through 45 and 56 through 61, and Takahashi Claims 4 through 20 and 28 through 33.

2. Detailed explanation of claim correspondence

Count 1

Applicants respectfully submit that Yamazaki Claims 27, 28, 46 through 55, and 71 through 77, and Takahashi Claims 1 through 3 and 21 through 27 correspond to Count 1 as follows:

(1) Takahashi Claim 1

Takahashi Claim 1 differs from Count 1 only in that Takahashi Claim 1 requires that the XZ-plane contains the observer's visual axis. That plane is one related to a salient feature of the optical system of Count 1. Accordingly, Takahashi Claim 1 would have been obvious in view of Count 1 absent unexpectedly improved results.

(2) Takahashi Claims 2 and 3

Takahashi Claims 2 and 3 are similar to Takahashi Claim 1, but further define the internal reflection of the first surface. Thus, each claim differs from Count 1 by requiring (a) that the XZ-plane contain the observer's visual axis and (b) that the internal reflection that is performed by the first surface is total reflection, with Takahashi Claim 3 further requiring (c) that the first surface has an internally reflecting region which has been mirror coated. (While both claims recite that the space defined by --at least-- the first, second, and third surfaces is filled, this language is met by Count 1.)

Limitation (a) has been discussed above with respect to Takahashi Claim 1. With respect to limitation (b), it was known in the art to effect internal reflection by using a totally reflecting surface as shown by European Patent Document 0 583 116 (Ingleton). That document discloses a surface 21 which utilizes total internal reflection (TIR). See, e.g., col. 3, lines 1 through 3. Accordingly, Takahashi Claim 2 would have been obvious in view of Count 1 in combination with Ingleton.

As for limitation (c), it was also known in the art to effect reflection by the use of mirrors as shown by U.S. Patent No. 5,594,588 (Togino '588) and Japanese Laid-Open Patent Application No. 5-303056 (JP '056). Accordingly, it would have been a matter of expediency to effect the internal

reflection of the first surface by using not only total reflection but additionally a mirror coated region. As a result, Takahashi Claim 3 would have been obvious in view of Count 1 in combination with Ingleton and either Togino '588 or JP '056.

(3) Takahashi Claims 21 through 23

Takahashi Claims 21 through 23 are similar to Takahashi Claims 1 through 3, respectively, but further require that the device for displaying an image is disposed at a position facing the third surface.

As Count 1 already recites that the third surface is closest to the device for displaying an image, it would have logically followed that the device for displaying an image would be arranged to --face-- the third surface. For this reason, and the reasons advanced above with respect to Takahashi Claims 1 through 3, Takahashi Claims 21 through 23 should correspond to Count 1.

(4) Takahashi Claims 24 through 27

Takahashi Claims 24 through 27 differ from Count 1 in the same manner as Takahashi Claims 21 through 23 from which they depend, and further in that they require:

(a) means for positioning both the device for displaying an image and the ocular optical system with respect to an observer's head (Takahashi Claim 24);

(b) means for supporting both the device for displaying an image and the ocular optical system with respect to an observer's head so that the optical apparatus can be fitted to the observer's head (Takahashi Claim 25);

(c) means for supporting at least a pair of the optical apparatuses at a predetermined spacing (Takahashi Claim 26); and

(d) that the ocular optical system is used as an imaging optical system (Takahashi Claim 27).

With respect to (a) through (c), such positioning and supporting means were known in the art as shown by U.S. Patent No. 5,436,765 (Togino '765). That patent discloses mounting a visual display apparatus, which has a pair of optical systems and display elements, on an observer's head. See, e.g., Figs. 22(a) and 22(b). Applicants submit that one having ordinary skill in the art would have been motivated to mount the optical apparatus of Count 1 on an observer's head using the positioning and supporting structure of Togino '765 to provide a head mounted display. Takahashi Claims 24 through 26 thus would have been obvious in view of Count 1 combined with the art.

As for limitation (d), given that Count 1 recites an ocular optical system for leading an image to an observer's eyeball, and given that the ocular optical system for enlargement of the image has a positive power, and given that it was known in the art to use ocular optical systems as

imaging optical systems (e.g., U.S. Patent No. 5,093,567 (Staveley) (e.g., col. 5, lines 1 through 9; col. 6, lines 3 through 14; Fig. 6, items 15 and 37; Fig. 10, items 50 and 72)), one having ordinary skill in the art would have been motivated to so use the ocular optical system. See also U.S. Patent No. 5,640,632 (Koyama, et al.), which discloses, e.g., using a prism for forming an image in view finder. Thus, Takahashi Claim 27 would have been obvious in view of Count 1 combined with the art.

(5) Yamazaki Claim 27

Yamazaki Claim 27 differs from Count 1 only in that Yamazaki Claim 27 recites a narrowed condition

$$1 < |R_{y2}/R_{x2}| \leq 1.921$$

falling within the condition of Count 1,

$$0.5 < |R_{y2}/R_{x2}| \leq 5;$$

accordingly, Yamazaki Claim 27 would have been obvious in view of Count 1 in the absence of unexpectedly improved results.

(6) Yamazaki Claim 28

Yamazaki Claim 28 differs from Count 1 only in that Yamazaki Claim 28 (a) recites the narrowed condition $1 < |R_{y2}/R_{x2}| \leq 1.921$ of Takahashi Claim 27 and (b) recites that internal reflection that is performed by the first surface is total reflection (while Yamazaki Claim 28 also recites that

the space defined by the --at least-- first, second, and third surfaces is filled, this language is met by that of Count 1, as discussed above with respect to Takahashi Claim 2). For the reasons advanced above with respect to Yamazaki Claim 27 and Takahashi Claim 2, Yamazaki Claim 28 would have been obvious in view of Count 1 combined with the art.

(7) Yamazaki Claims 46 and 51

Yamazaki Claims 46 and 51 are similar to Yamazaki Claims 27 and 28, respectively, but further require that the device for displaying an image is disposed at a position facing the third surface. For the reasons advanced with respect to Yamazaki Claims 27 and 28, and Takahashi Claims 21 and 22, these claims should also correspond to Count 1.

(8) Yamazaki Claims 47 through 50 and 52 through 55

Yamazaki Claims 47 through 50 and 52 through 55 depend from Yamazaki Claims 46 and 51 and further recite the conventional features discussed above with respect to Takahashi Claims 22 through 24. Accordingly, for the reasons discussed above with respect to Yamazaki Claims 46 and 51 and Takahashi Claims 22 through 24, these claims should also correspond to Count 1.

(9) Yamazaki Claims 71 through 73

Yamazaki Claim 71 depends from Yamazaki Claims 27, 28, and 46 through 55, and recites a narrowed condition

$$1.421 < |R_{y2}/R_{x2}| \leq 1.921$$

falling within the condition of Count 1,

$$0.5 < |R_{y2}/R_{x2}| \leq 5.$$

In the absence of unexpectedly improved results, and for the reasons advanced above with respect to the claims from which this claim depends, Yamazaki Claim 71 would have been obvious in view of Count 1 and the art.

Yamazaki Claims 72 and 73 recite specific values of R_{y2}/R_{x2}, or R_{y2} and R_{x2}, all falling within the condition of Count 1, and should correspond to Count 1 for the reasons advanced above with respect to Yamazaki Claim 71, absent a showing of unexpectedly improved results.

(10) Yamazaki Claims 74 through 77

Yamazaki Claims 74 through 77 variously depend from Yamazaki Claims 27, 28, and 46 through 55, and recite that the XZ-plane passes through the vertex of the second surface and is perpendicular to the tangent at the vertex.

This plane is one related to a salient feature of the optical system of Count 1. Accordingly, in the absence of unexpectedly improved results, and for the reasons advanced above with respect to the claims from which these

claims depend, Yamazaki Claims 74 through 77 also would have been obvious in view of Count 1 and the art.

Count 2

Applicants respectfully submit that Yamazaki Claims 29 through 45 and 56 through 61, and Takahashi Claims 4 through 20 and 28 through 33 correspond to Count 2, as follows:

(1) Takahashi Claim 4 and Yamazaki Claim 29

Takahashi Claim 4 and Yamazaki Claim 29 are substantially similar to Count 2 (they differ only by reciting that the space defined by said --at least-- first, second, and third surfaces is filled, which is met by recitation in Count 2 that the space defined by said first, second, and third surfaces is filled).

(2) Takahashi Claim 5 and Yamazaki Claim 30

Takahashi Claim 5 and Yamazaki Claim 30 are similar to Takahashi Claim 4 and Yamazaki Claim 29, but further recite that internal reflection that is performed by the first surface is total reflection. This recitation has been discussed above with respect to Takahashi Claim 1. By analogous reasoning, Takahashi Claim 5 and Yamazaki Claim 30 would have been obvious in view of Count 1 in combination with Ingleton.

(3) Takahashi Claims 28 and 29 and Yamazaki Claims 56 and 57

Takahashi Claims 28 and 29 and Yamazaki Claims 56 and 57 are similar to Takahashi Claims 4 and 5 and Yamazaki Claims 29 and 30, respectively, but further recite that the device for displaying an image is disposed at a position facing the third surface. As Count 2 already recites that the third surface is closest to the device for displaying an image, it would have logically followed that the device for displaying an image would be arranged to --face-- the third surface. For this reason, and the reasons advanced above with respect to Takahashi Claims 4 and 5 and Yamazaki Claims 29 and 30, Takahashi Claims 28 and 29 and Yamazaki Claims 56 and 57 should correspond to Count 2.

(4) Takahashi Claims 6 through 10 and 30 through 33 and Yamazaki Claims 31 through 35 and 58 through 61

Takahashi Claims 6 through 10 and 30 through 33 and Yamazaki Claims 31 through 35 and 58 through 61 differ from Count 2 in the same manner as Takahashi Claims 4, 5, 28, and 29 and Yamazaki Claims 29, 30, 56, and 57 from which they ultimately depend, and by reciting one or various combinations of the following features:

(a) that either one of the first and third surfaces of the ocular optical system is tilted or decentered with respect to the observer's visual axis (Takahashi Claim 6 and Yamazaki Claim 31);

(b) means for positioning both the device for displaying an image and the ocular optical system with respect to an observer's head (Takahashi Claims 7 and 30 and Yamazaki Claims 32 and 58);

(c) means for supporting both the device for displaying an image and the ocular optical system with respect to an observer's head so that the optical apparatus can be fitted to the observer's head (Takahashi Claims 8 and 31 and Yamazaki Claims 33 and 59);

(d) means for supporting at least a pair of the optical apparatuses at a predetermined spacing (Takahashi Claims 9 and 32 and Yamazaki Claims 34 and 60);

(e) that the ocular optical system is used as an imaging optical system (Takahashi Claims 10 and 33 and Yamazaki Claims 35 and 61).

With respect to recitation (a), it was known in the art to provide tilted and decentered surfaces in a prism arrangement, as shown by Ingleton (see, e.g., Fig. 5, surfaces 21 and 30). One having ordinary skill in the art would have been motivated to provide the same in the system of Count 2 to provide a compact optical arrangement.

With respect to recitations (b) through (d), as discussed above with respect to Takahashi Claims 24 through 27, such positioning and supporting means were known in the art as shown by U.S. Patent No. 5,436,765 (Togino '765). That patent discloses mounting a visual display apparatus,

which has a pair of optical systems and display elements, on an observer's head. See, e.g., Figs. 22(a) and 22(b). Accordingly, Applicants submit that one having ordinary skill in the art would have been motivated to mount the optical apparatus of Count 2 on an observer's head using the positioning and supporting structure of Togino '765 to supply a head mounted display.

As for limitation (d), given that Count 2 recites an ocular optical system for leading an image to an observer's eyeball, and given that the ocular optical system for enlargement of the image has a positive power, and given that it was known in the art to use ocular optical systems as imaging optical systems (e.g., U.S. Patent No. 5,093,567 (Staveley) (e.g., col. 5, lines 1 through 9; col. 6, lines 3 through 14; Fig. 6, items 15 and 37; Fig. 10, items 50 and 72)), one having ordinary skill in the art would have been motivated to so use the ocular optical system. See also U.S. Patent No. 5,640,632 (Koyama, et al.), which discloses, e.g., using a prism for forming an image in view finder.

In view of the foregoing, Takahashi Claims 6 through 10 and 30 through 33 and Yamazaki Claims 31 through 35 and 58 through 61 would have been obvious in view of Count 2 combined with the art.

(5) Takahashi Claims 11 through 20 and Yamazaki Claims 36 through 45

Takahashi Claim 11 and Yamazaki Claim 36 differ from Count 2 in the same manner as Takahashi Claim 6 and Yamazaki Claim 31 from which they depend (i.e., by reciting one or both of the following features (a) that either one of the first and third surfaces is tilted or decentered, and (b) that the internal reflection is total reflection), and by further requiring that:

$10 \leq \theta \leq 40$ (Takahashi Claim 11) or

θ=27.5, 33.4, 26.4, 27.3, 28.2, or 25.6 (Yamazaki Claim 36)

where θ is an angle between said visual axis and a line normal to said second surface of said ocular optical system in the vicinity of an intersection between said observer's visual axis and said second surface.

Recitations (a) and (b) have been discussed above with respect to Takahashi Claims 5 and 6 and Yamazaki Claims 30 and 31. With respect to the angle limitation, Applicants respectfully submit that the same would be a matter of design choice in positioning the optics to the observer's face.

In view of the foregoing, Applicants respectfully submit that Takahashi Claim 11 and Yamazaki Claim 36 would have been obvious in view of Count 2 and the art.

Takahashi Claims 12 through 20 and Yamazaki Claims 37 through 45 ultimately depend upon Takahashi Claim 11 and Yamazaki Claim 36, respectively. These claims merely further recite various combinations of the conventional features (b)

through (e) discussed above with respect to Takahashi Claims 6 through 10 and 30 through 33 and Yamazaki Claims 31 through 35 and 58 through 61, with the exception of Takahashi Claim 16 and Yamazaki Claim 41, and their dependent claims, which require that the display surface be tilted. This feature was known in the art as shown by Togino '765, which discloses a tilted image display element (e.g., Fig. 1, item 1). Applicants respectfully submit that one having ordinary skill in the art would have been motivated to provide the same in the system of Count 2 to provide a compact optical arrangement.

In view of the foregoing, Applicants respectfully submit that Takahashi Claims 11 through 20 and Yamazaki Claims 36 through 45 would have been obvious in view of Count 2 and the art.

C. Support for Yamazaki Claims

The following establishes that the terms of Yamazaki Claims 27 through 77 are supported by the present application.

(1) Yamazaki Claims 27, 28, 46, and 51

(a) Yamazaki Claim 27

Yamazaki Claim 27 is an independent claim and is supported as shown by the following Table A:

TABLE A

Yamazaki Claim 27	Present Application
[27(a)] An optical apparatus comprising:	[27(a)] An optical device is disclosed. See, e.g., p. 1, lines 5-8; p. 2, line 27; p. 3, line 12; p. 6, line 7.
[27(b)] a device for displaying an image; and	[27(b)] The device includes a display means 4 composed of, for example, a liquid crystal display (LCD) device. See, e.g., p. 6, lines 9 through 11; p. 15, lines 22 and 23; p. 23, lines 6 through 10; p. 49, lines 20 through 22; Figs. 1A through 8B, 12A through 19B, and 23A and 23B.
[27(c)] an ocular optical system for projecting an image formed by said device for displaying an image and for leading the image to an observer's eyeball;	[27(c)] The display device also includes an optical system 3 having a first optical member 3a which guides light from the display means 4 to the eye of the observer. See, e.g., p. 6, lines 11-14; p. 8, line 26; p. 23, line 25 through p. 24, line 1; p. 51, lines 3 through 5 and 20 through 22; Figs. 1A through 8B, 12A through 19B, and 23A and 23B.

[27(d)] said ocular optical system comprising first, second and third surfaces, in which a space defined by said first, second and third surfaces is filled with a medium having a refractive index larger than 1;	[27(d)] The first ocular member 3a includes a totally reflecting face 1, a concave mirror 2, and a light entrance face 5, and is made of, e.g., acrylic resin or glass. See, e.g., p. 6, lines 11 through 21; p. 7, lines 13 through 19; p. 8, lines 2 through 4, 19, and 20; p. 9, lines 25 through 27; p. 11, lines 7 through 10; p. 17, lines 4 through 6; p. 23, lines 17 through 23; p. 25, lines 3 through 11; p. 27, line 14 through p. 28, line 11; p. 31, lines 13 through 15; p. 32, line 24; p. 34, lines 24 through 27; p. 49, line 27 through page 50, line 5; page 51, lines 13 through 22; Numerical Examples 1 through 9; Figs. 1A through 8B, 12A through 19B, and 23A and 23B.

[27(e)] said first, second and third surfaces including, in order from an observer's eyeball side toward said device for displaying an image, [(1)] a first surface serving as both a refracting surface and an internally reflecting surface, [(2)] a second surface serving as a reflecting surface of positive power which faces said first surface and is decentered or tilted with respect to an observer's visual axis, and [(3)] a third surface serving as a refracting surface closest to said device for displaying an image, at least two of said at least three surfaces having a finite curvature radius;	[27(e)] [(1)] The totally reflecting face 1 is included in the first optical member 3a. See, e.g., p. 6, lines 16, 17, 20, and 21; p. 7, lines 20 through 27. [(2)] The concave mirror 2 is also included in the first optical member 3a. See, e.g., p. 6, lines 18 and 19; p. 7, lines p. 7, lines 15 through 24; p. 9, lines 25 through 27; p. 10, lines 3 through 8. [(3)] The light entrance face 5 is also included in the first optical member 3a. See, e.g., p. 11, line 25; Figs. 1A through 8B, 12A through 19B, and 23A and 23B; Numerical Examples 1 through 9. The Numerical Examples also show that at least two of the surfaces have finite curvatures.
[27(f)] wherein any one of said first, second and third surfaces is a decentered aspherical surface;	[27(f)] The concave mirror 2 is positioned eccentrically, and preferably is an aspherical surface. See, e.g., p. 7, lines 15 through 17; p. 9, lines 25 through 27; p. 10, lines 6 through 8. More particularly, Figs. 2A and 2B show use of a toric aspheric surface in the concave mirror 2 and the totally reflecting face 1, while Figs. 3A, 3B, and 4A through 5B show use of aspherical surfaces in all of the faces. See, e.g., p. 16, lines 17 through 26, p. 17, lines 7 through 21; p. 23, lines 127 through 23; p. 28, lines 12 through 28; p. 50, lines 1 through 3; Numerical Examples 1 through 9.

[27(g)] wherein any one of said first, second and third surfaces is an anamorphic surface;	[27(g)] In Figs. 2A and 2B, the concave mirror 2 and the totally reflecting face are toric, while in Figs. 3A, 3B, and 4A through 5B, the concave mirror 2, the totally reflecting face 1, and the light entrance face 5 are all anamorphic. See, e.g., p. 10, lines 3 through 6; p. 10, lines 3 through 8; p. 10, line 23 through p. 12, line 11; p. 16, lines 17 through 26; p. 17, lines 7 through 21; p. 23, lines 17 through 23; p. 28, lines 12 through 18; Numerical Examples 1 through 9.
[27(h)] wherein said optical apparatus satisfies the following condition in a case where a vertical plane containing said observer's visual axis is defined as a YZ-plane, and a horizontal plane perpendicular to the YZ-plane is defined as an XZ-plane: $1 < \lvert R_{y2}/R_{x2} \rvert \leq 1.921$ where R_{y2} is a curvature radius of said second surface in the YZ-plane, and R_{x2} is a curvature radius of said second surface in the XZ-plane.	[27(h)] The conditions $\lvert r_x \rvert < \lvert r_y \rvert$ and $\lvert r_x/r_y \rvert < 0.85$ are set forth for the concave mirror 2. The former condition supports the lower limit (i.e., 1), and the Numerical Examples yield values of 1.421, 1.921, 1.730, 1.732, 1.493, 1.921, 1.802 or 1.820, which supports the upper limit (i.e., 1.921). See, e.g., p. 10, line 23 through p. 11, line 24; p. 31, line 8 through p. 32, line 5; Numerical Examples 1 through 9.

(b) Yamazaki Claim 28

Yamazaki Claim 28 is an independent claim similar to Yamazaki Claim 27 but which further requires that the internal reflection that is performed by the first surface is total reflection, which is supported by totally reflecting face 1. See, e.g., p. 6, lines 16 and 17; p. 7, lines 13 through 15; p. 10, line 2; p. 23, lines 17 through 19; p. 25,

lines 7 through 11; p. 51, line 17; Numerical Examples 1 through 9.

(c) Yamazaki Claims 46 and 51

Yamazaki Claims 46 and 51 are independent claims similar to Yamazaki Claims 27 and 28, respectively, but which further require that the device for displaying an image is disposed at a position facing the third surface, as disclosed at, e.g., p. 6, lines 14 through 16; p. 25, lines 3 through 7; p. 51, lines 13 through 17; Numerical Examples 1 through 9.

(2) Yamazaki Claims 47 through 50 and 52 through 55

Yamazaki Claims 47 through 50 and 52 through 55 depend from Yamazaki Claims 46 or 51 and further recite:

(a) that the optical apparatus further comprises means for positioning both the device for displaying an image and the ocular optical system, with respect to an observer's head (Yamazaki Claims 47 and 52) or supporting the same with respect to an observer's head so that the optical apparatus can be fitted to the observer's head (Yamazaki Claims 48 and 53);

(b) that the optical apparatus further comprises means for supporting a pair of the optical

apparatuses at a predetermined spacing (Yamazaki Claims 49 and 54); and

(c) that the ocular optical system is used as an imaging optical system (Yamazaki Claims 50 and 55).

Support for (a) and (b) may be found at, e.g., Figs. 10 and 11, which show that the display device can be mounted on the head of the observer as a so-called head-up or spectacle-type display. See, e.g., p. 1, lines 6 through 8; p. 22, lines 1 and 2; p. 23, lines 1 through 4.

As for (c), the present application discloses that the imaging lens 8 images light that passes through the optical member 3, thus supporting the recitation of an imaging system. See, e.g., p. 13, lines 8 through 13; p. 52, lines 7 through 19; Numerical Examples 5 through 9 (Figs. 8B, 9, 16, 19B, and 23B).

(3) Yamazaki Claim 71

Yamazaki Claim 71 depends from Yamazaki Claims 27, 28, and 46 through 55, and recites the narrowed condition, $1.421 \leq R_{y2}/R_{x2} \leq 1.921$, the lower and upper limits corresponding to the smallest and greatest values associated with Numerical Examples 1 through 9 (i.e., Numerical Example 1 (1.421) and Numerical Examples 2 and 7 (1.921)).

(4) Yamazaki Claim 72

Yamazaki Claim 72 depends from Yamazaki Claim 71 and recites specific values of R_{y2}/R_{x2} corresponding to Numerical Examples 1 through 9, respectively.

(5) Yamazaki Claim 73

Yamazaki Claim 73 depends from Yamazaki Claim 72 and recites eight pairs of R_{y2} and R_{x2} values corresponding to Numerical Examples 1 through 9, respectively.

(6) Yamazaki Claims 74 through 77

Yamazaki Claims 74 through 77 variously depend from Yamazaki Claims 27, 28, 46 through 55, and 71 through 73, and recite that the XZ-plane passes through the vertex of the second surface and is perpendicular to the tangent at the vertex, which is the coordinate system attendant to the claimed values.

(8) Yamazaki Claims 29, 30, 56, and 57

(a) Yamazaki Claim 29

Yamazaki Claim 29 is an independent claim and is supported as shown by the following Table B:

TABLE B

Yamazaki Claim 29	Present Application
[29(a)] An optical apparatus comprising:	[29(a)] see 27(a)

[29(b)] a device for displaying an image; and	[29(b)] see 27(b)
[29(c)] an ocular optical system for projecting an image formed by said device for displaying an image and for leading the image to an observer's eyeball,	[29(c)] see 27(c)
[29(d)] said ocular optical system comprising first, second and third surfaces, in which a space defined by said at least first, second and third surfaces is filled with a medium having a refractive index larger than 1,	[29(d)] see 27(d)
[29(e)] said first, second and third surfaces including, in order from an observer's eyeball side toward said device for displaying an image, a first surface serving as both a refracting surface and an internally reflecting surface, a second surface serving as a reflecting surface of positive power which faces said first surface and is decentered or tilted with respect to an observer's visual axis, and a third surface serving as a refracting surface closest to said device for displaying an image, at least two of said at least first, second and third surfaces having a finite curvature radius; and	[29(e)] see 27(e)
[29(f)] wherein said first surface is a reflecting surface having a convex surface directed toward said second surface.	[29(f)] The totally reflecting face 1 is concave to the eye (i.e., it is convex toward the concave mirror 2). See, e.g., p. 8, lines 12 through 15; p. 9, lines 20 and 21; p. 29, lines 4 and 5; p. 29, lines 12 through 14; Numerical Examples 1 through 9.

(b) Yamazaki Claim 30

Yamazaki Claim 30 is an independent claim similar to Yamazaki Claim 29 but which further recites that the internal reflection that is performed by the first surface is total reflection. Support may be found as indicated above with respect to Yamazaki Claims 28 and 29.

(c) Yamazaki Claims 56 and 57

Yamazaki Claims 56 and 57 are independent claims similar to Yamazaki Claims 29 and 30, respectively, but which further recite that the device for displaying an image is disposed at a position facing the third surface. Support may be found as indicated above with respect to Yamazaki Claims 29, 30, 46, and 51.

(9) Yamazaki Claim 31

Yamazaki Claim 31 depends from Yamazaki Claims 29 or 30 and further recites that either one of said first and third surfaces of said ocular optical system is tilted or decentered with respect to the observer's visual axis. Support may be found, e.g., in Numerical Examples 1 through 9.

(10) Yamazaki Claims 32 through 45 and 58 through 61

Yamazaki Claims 32 through 45 and 58 through 61 variously depend ultimately from Yamazaki Claims 29 or 30

(via Yamazaki Claim 31) or from Yamazaki Claims 56 or 57 and further recite one or more of the following features:

(a) that the optical apparatus further comprises means for positioning both the device for displaying an image and the ocular optical system, with respect to an observer's head (Yamazaki Claims 32, 37, 42, and 58) or supporting the same with respect to an observer's head so that the optical apparatus can be fitted to the observer's head (Yamazaki Claims 33, 38, 43, and 59);

(b) that the optical apparatus further comprises means for supporting a pair of the optical apparatuses at a predetermined spacing (Yamazaki Claims 34, 39, 44, and 60);

(c) that the ocular optical system is used as an imaging optical system (Yamazaki Claims 35, 40, 45, and 61);

(d) that the following condition is satisfied θ=27.5, 33.4, 26.4, 27.3, 28.2, or 25.6 where θ is an angle between the visual axis and a line normal to the second surface of the ocular optical system in the vicinity of an intersection between the observer's visual axis and the second surface (Yamazaki Claim 36); and

(e) that the device for displaying an image has a display surface which is tilted with respect to the observer's visual axis (Yamazaki Claim 41).

Support for features (a) through (c) may be found in the portions of the specification discussed above with respect to Yamazaki Claims 47 through 50 and 52 through 55.

With respect to feature (d), Applicants respectfully submit that the six angles are calculable from (a) Numerical Example 1, (b) Numerical Examples 2 and 6, (c) Numerical Example 3, (d) Numerical Example 4, (e) Numerical Example 5, and (f) Numerical Example 7, respectively.

Lastly, with respect to feature (e), the recitation that display surface is tilted with respect to the observer's visual axis is supported by Numerical Examples 1 through 9.

D. Benefit of Earlier Applications

Applicants are entitled to the benefit of the following applications (1) through (3) for proposed Count 1 and of applications (1) through (4) for proposed Count 2.

(1) U.S. Patent Application No. 08/478,688 filed June 7, 19995 (the "'688 Application");

(2) Japanese Patent Application No. 6-130301 filed June 13, 1994 (the "'301 Application");

(3) Japanese Patent Application No. 6-204268 filed August 5, 1994 (the "'268 Application"); and

(4) Japanese Patent Application No. 6-336063 filed December 22, 1994 (the "'063 Application").

In particular, the present application is a continuation application under former 37 CFR 1.62 of the '688 Application, and the specification and drawings of these applications as filed are identical, and the '688 Application constitutes a constructive reduction to practice of the subject matter of proposed Counts 1 and 2.

As shown by the following Tables C and D, the terms of proposed Counts 1 and 2 are also supported by each of the '301 and '268 Applications, while the terms of proposed Count 2 are also supported by the '063 Application, thus establishing that each such application constitutes a constructive reduction to practice of the subject matter of the proposed counts (references in Table C and D are to the pages and line numbers of the sworn English translations filed June 16, 1999).

TABLE C

Count 1	'301	'268
[1(a)] An optical apparatus comprising:	[1(a)] A display device is disclosed. See, e.g., p. 4, [0001], lines 4-5; p. 8, [0013], line 3; Figs. 1 through 5.	[1(a)] See, e.g., p. 8, [0001], line 2.
[1(b)] a device for displaying an image; and	[1(b)] The display device includes a display means 4 composed of, for example, a liquid crystal display (LCD) device. See, e.g., p. 7, [0010], lines 4 through 7; Figs. 1 through 5.	[1(b)] See, e.g., p. 18, [0019], lines 2 through 4; Figs. 1 and 6 through 12.
[1(c)] an ocular optical system for projecting an image formed by said device for displaying an image and for leading the image to an observer's eyeball;	[1(c)] The display device also includes an optical system 3 having a first optical member 3a that guides the light from the display means 4 to the eye of the observer. See, e.g., p. 10, [0017], line 3; Figs. 1 through 5.	[1(c)] See, e.g., p. 18, [0020]; Figs. 1 through 3 and 6 through 12.

[1(d)] said ocular optical system comprising first, second and third surfaces, in which a space defined by said first, second and third surfaces is filled with a medium having a refractive index larger than 1;	[1(d)] The first optical member 3a includes a totally reflecting face 1, a concave mirror 2, and a light entrance face 5, and is made of, e.g., acrylic resin or glass or a material with a refractive index greater than one. See, e.g., p. 7, [0010], lines 12 through 15; p. 13, [0025], line 1; p. 19, [0037], lines 1 through 3; Numerical Examples 1 through 4; Figs. 1 through 5.	[1(d)] See, e.g., p. 18, [0020], lines 1 through 7; p. 18, [0020], line 7; p. 20, [0022], lines 10 through 13; Numerical Examples 1 through 5; Figs. 1 through 3 and 6 through 12.

[1(e)] said first, second and third surfaces including, in order from an observer's eyeball side toward said device for displaying an image, [(1)] a first surface serving as both a refracting surface and an internally reflecting surface, [(2)] a second surface serving as a reflecting surface of positive power which faces said first surface and is decentered or tilted with respect to an observer's visual axis, and [(3)] a third surface serving as a refracting surface closest to said device for displaying an image, at least two of said at least three surfaces, or at least two of said at least first, second and third surfaces, having a finite curvature radius;	[1(e)] [(1)] The totally reflecting face 1 is included in the first optical member 3a. See, e.g., p. 7, [0010], lines 12 and 13. [(2)] The concave mirror 2 is also included in the first optical member 3a. See, e.g., p. 7, [0010], lines 14 and 15; Figs. 1 through 5. [(3)] The light entrance face 5 is also included in the first optical member 3a. See, e.g., p. 13, [0025], line 1; Figs. 1 through 5. Numerical Examples 1 through 4.	[1(e)] See, e.g., p. 18, [0020], lines 4 through 7; p. 20, [0022], lines 11 and 12; p. 18, [0020], line 7; Numerical Examples 1 through 5; Figs. 1 through 3 and 6 through 12.

[1(f)] wherein any one of said first, second and third surfaces is a decentered aspherical surface;	[1(f)] The concave mirror 2 is positioned eccentrically and preferably is an aspherical surface. More particularly, the configuration in Fig. 2 has toric aspheric surfaces in the concave mirror 2 and the totally reflecting face 1. The configuration in Fig. 3 has anamorphic aspherical surfaces in all of the faces. See, e.g., [0014], [0020], [0035]; Numerical Examples 1 through 4.	[1(f)] See, e.g., [0020], [0030]; Numerical Examples 1 through 5.
[1(g)] wherein any one of said first, second and third surfaces is an anamorphic surface;	[1(g)] See 1(f); see also [0015]; [0022] through [0024].	[1(g)] See 1(f); see also [0028]; [0038]; [0039].

[1(h)] wherein said optical apparatus satisfies the following condition in a case where a vertical plane containing said observer's visual axis is defined as a YZ-plane, and a horizontal plane perpendicular to the YZ-plane is defined as an XZ-plane: $0.5 < \|R_{y2}/R_{x2}\| \leq 5$ where R_{y2} is a curvature radius of said second surface in the YZ-plane, and R_{x2} is a curvature radius of said second surface in the XZ-plane.	[1(h)] The concave mirror 2 satisfies the condition $\|r_x\| < \|r_y\|$; see, e.g., [0022]; Numerical Examples 1 through 4.	[1(h)] See, e.g., [0038]; Numerical Examples 1 through 5.

TABLE D

Count 2	'063	'301	'268
[2(a)] An optical apparatus comprising:	A display device is disclosed. [0012]	[2(a)] See 1(a)	[2(a)] See 1(a)
[2(b)] a device for displaying an image; and	The device includes a display means 4. [0017]; Figs. 1(A) and 5(A)	[2(b)] See 1(b)	[2(b)] See 1(b)
[2(c)] an ocular optical system for projecting an image formed by said device for displaying an image and for leading the image to an observer's eyeball;	The device also includes a first optical member 3A. [0018]; Figs. 1(A) and 5(A)	[2(c)] See 1(c)	[2(c)] See 1(c)

[2(d)] said ocular optical system comprising first, second and third surfaces, in which a space defined by said first, second and third surfaces is filled with a medium having a refractive index larger than 1;	The first optical member 3A is a member having faces 1, 2a, and 5. [0018]; Figs. 1(A) and 5(A).	[2(d)] See 1(d)	[2(d)] See 1(d)
[2(e)] said first, second and third surfaces including, in order from an observer's eyeball side toward said device for displaying an image, a first surface serving as both a refracting surface and an internally reflecting surface, a second surface serving as a reflecting surface of positive power which faces said first surface and is decentered or tilted with respect to an observer's visual axis, and a third surface serving as a refracting surface closest to said device for displaying an image, at least two of said at least first, second and third surfaces, having a finite curvature radius;	The face 1 is a flat or aspherical face partially utilizing total reflection The face 2 is a reflecting spherical or aspherical convex face. The face 5 is closest to the display means 4. [0018]; Figs. 1(A) and 5(A).	[2(e)] See 1(e)	[2(e)] See 1(e)

[2(f)] wherein said first surface is a reflecting surface having a convex surface directed toward said second surface.	Figs. 1(A) and 5(A).	The totally reflecting face 1 is concave to the eye (i.e., it is convex toward the concave mirror 2). See, e.g., [0016]; [0019]; Numerical Examples 1 through 4.	See, e.g., [0032]; [0033]; Numerical Examples 1 through 5.

E. Summary of Proposed Interference

The following tables summarize Applicants' proposal for the interference, with Counts 1 and 2 as proposed above:

Applicants (Senior Party):	Shoichi Yamazaki and Takeshi Nishimura
Application No.:	U.S. Patent Application No. 08/959,285 filed October 24, 1997
For:	HEAD-UP DISPLAY DEVICE WITH CURVED OPTICAL SURFACE HAVING TOTAL REFLECTION (AS AMENDED)
Assignee:	Canon Kabushiki Kaisha

Accorded Benefit:	Count 1: (1) U.S. Patent Application No. 08/478,688 filed June 7, 1995; (2) Japanese Patent Application No. 6-130301 filed June 13, 1994; and (3) Japanese Patent Application No. 6-204268 filed August 5, 1994 Count 2: (1) U.S. Patent Application No. 08/478,688 filed June 7, 1995; (2) Japanese Patent Application No. 6-130301 filed June 13, 1994; (3) Japanese Patent Application No. 6-204268 filed August 5, 1994; and (4) Japanese Patent Application No. 6-336063 filed December 22, 1994.
Claims corresponding to Count 1:	Claims 27, 28, 46 through 55, and 71 through 77
Claims corresponding to Count 2:	Claims 29 through 45 and 56 through 61

Patentee (Junior Party)	Koichi Takahashi
Application No.:	U.S. Patent Application No. 08/505,516 filed July 21, 1995, Patent No. 5,701,202 granted December 23, 1997
For:	HEAD OR FACE MOUNTED IMAGE DISPLAY APPARATUS
Assignee:	Olympus Optical Co., Ltd.
Claims corresponding to Count 1:	Claims 1 through 3 and 11 through 27
Claims corresponding to Count 2:	Claims 4 through 10 and 28 through 33

CONCLUSION

Since the requirements of 37 CFR 1.607 have been satisfied, Applicants request that an interference, with Counts 1 and 2 as proposed above, be declared between the present application and the '202 Patent. Applicants also respectfully request senior party status by virtue of the earlier filing date. In addition, Applicants respectfully requests benefit for priority of the filing dates of the '688, '301, and '268 Applications for proposed Count 1 and benefit of the filing dates of the '688, '301, '268, and '063 Applications for proposed Count 2.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,

Daniel Gluck

Attorney for Applicants

Registration No. 37,838

FITZPATRICK, CELLA, HARPER & SCINTO
30 Rockefeller Plaza
New York, New York 10112-3801
Facsimile: (212) 218-2200